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OKLAHOMA EARTHQUAKES SHAKE UP THE FRACKING CONVERSATION

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As if we needed anything else to shake up this year's election cycle, a recent earthquake in Oklahoma has provided yet another point of controversy for Americans to keep in mind as they head to the polls this fall.[i] (file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_edn1) Pawnee, Oklahoma was home to the latest of a string of seismic events that have added to the weight of a pending lawsuit between one of the largest environmental organizations in the United States[ii] (file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_edn2) and four producers and developers of natural gas, oil, and natural gas liquids.[iii] (file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_edn3) Sierra Club, plaintiff in the action, is claiming that, "the spike in earthquakes stems from the injection of wastewater from fracking[iv] (file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_edn4) and other oil and gas development activities into thousands of deep wells around Oklahoma." [v] (file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_edn5) Defendants, on the other hand, raise valid concerns regarding issues of causation.[vi] (file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_edn6)

The causation concern is not a novel one for scientists who make careers out of investigating environmental issues such as wastewater injection, fluid withdrawal, enhanced oil recovery, and hydraulic fracturing.[vii] (file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_edn7) According to the U.S. Geological Survey, "[s]cientific studies have linked the majority of this increased [seismic] activity to wastewater injection in deep disposal wells in several locations." [viii] (file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_edn8) However, the Survey also notes that some regions are known for earthquakes that occur independent of human activity.[ix] (file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_edn9) Still, the recent magnitude 5.8 earthquake should do more than just raise an eyebrow. The fact that states across the central and eastern parts of America have been experiencing a rapid increase in the number of induced earthquakes over the past 7 years makes the causation leap seem a bit more reasonable to make.[x] (file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_edn10)

The number of earthquakes occurring across the central and eastern portions of the United States is unprecedented. Between the years 1973-2008 there was an average of twenty-one earthquakes of magnitude three or higher, however the rate has increased to an average of ninety-nine per year from 2009-2013 and continues to rise.[xi]

(file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_edn11)

Furthermore, there is good reason to believe that this dramatic increase is due to wastewater injections, or wastewater disposal, such as that which is occurring in central Oklahoma.[xii]

(file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_edn12) Simply put, there have been more earthquakes in the last six years, as wastewater injection has increased, than the preceding 35 years.[xiii]

(file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_edn13)

So are the increased numbers of earthquakes naturally occurring and independent of human activity? Probably not. Characteristics that seismologists use to determine whether an earthquake is induced or natural include (but are not limited to) the following: change in seismicity rate, special correlation, temporal correlation, and closeness to the surface of the stress, or near surface.[xiv]

(file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_edn14) Given that the earthquake rate has increased in a few primary areas, these factors are helpful for scientists who are attempting to answer the causation questions that energy development companies continue to remain skeptical of.



One implication is that oil operations cause earthquakes through a fluid pressure effect produced by hydraulic fracturing, enhanced oil recovery, or wastewater disposal.[xv]

(file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_edn15) In some instances, if injected water is able to reach a fault line, it pries the fault apart and there is a decrease in the earth's natural resistance to slip, thus resulting in an increase in the likelihood of an earthquake.[xvi]

(file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_edn16) Although many earthquakes are often too small to be felt above the surface, the recent quake in Pawnee evidences the possibility of a major quake in the near future.

A second implication is that changes in solid stress conditions underground increase the likelihood of an earthquake occurring. Stress conditions are changed by adding volume, through the filling of a reservoir, or by removing volume, through the mining of underground material.[xvii]

(file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_edn17) When there are changes in solid stress due to fluid extraction or injection, the likelihood of an earthquake increases even without a direct connection to a fault line.[xviii]

(file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_edn18) In short, it seems that Sierra Club might have a point.

For voters who have been affected by the recent quakes, hydraulic fracturing will likely remain at the forefront of their minds this November. Although many of the local concerns with fracking will remain primarily state issues, [xix] (file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_edn19) this does not keep the two major party presidential candidates from having their own opinions on the matter.

While Hillary Clinton claims to be unequivocal in her support for limiting hydraulic fracturing, former Interior Secretary Ken Salazar, who has previously supported hydraulic fracturing in an effort for America to become energy independent, was recently selected to lead the Clinton-Kaine transition team in the White House.[xx]

(file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_edn20) On the other side of the aisle, Donald Trump has (kind of) broken with his party's traditional stance on the issue.[xxi] (file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_edn21) The Republican nominee has been quoted in saying, "I'm in favor of fracking, but I think that voters should have a big say in it," and "[i]f a municipality or a state wants to ban fracking, I can understand that." [xxii] (file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_edn22)

It is clear that the major party candidates have a number of constituencies to please. To her credit, Secretary Clinton has put out an extensive plan to revitalize the coal industry by repurposing mine lands and power plant sites, expanding clean energy, and offering new infrastructure as a means to job creation.[xxiii] (file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_edn23)

Donald Trump, while criticizing state regulations and tax laws that slow down or stop private companies, has at the same time voiced understanding of statewide fracking bans.[xxiv] (file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_edn24) Mr. Trump's understanding may be limited however, based on his published campaign views on unleashing "\$50 trillion" in energy reserves and expanding onshore and offshore leasing of coal and open shale deposits for development. [xxv] (file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_edn25)

Although neither campaign has published an official stance on the effects that hydraulic fracturing has on inducing earthquakes in the central and eastern states, I encourage voters to consider the potential implications of each candidate's stance, and to research how fracking may politically, and literally, change your state's landscape.

[i] (file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_ednref1) See Steven M. Sellers, *Recent Quake May Rattle Oklahoma Fracking Case*, Bloomberg BNA Env't Reporter (Sep. 6, 2016), http://news.bna.com.ezproxy.law.uky.edu/erln/ERLNBW/split_display.adp?fedfid=96862277&cvname=ernotallissues&jd=a0k0t4m6e5&split=0.

[ii] (file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_ednref2) See *About*, Sierra Club, <http://www.sierraclub.org/about> (last visited Oct. 10, 2016).

[iii] (file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_ednref3) Sellers, *supra* note i.

[iv] (file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_ednref4) See Tripp Baltz, *Faulty Wells, Not Fracking, Source of Methane Contamination*, Bloomberg BNA Env't Reporter (July 12, 2016), http://news.bna.com.ezproxy.law.uky.edu/erln/ERLNBW/split_display.adp?fedfid=93947261&cvname=ernotallissues&cwsn=496538500&searchid=28665710&doctypeid=1&trype=date&mode=doc&split=0&cscm=ERLNBW&pg=0. (Fracking is "the high-pressure injection of water, sand and chemicals into tight shale formations underground to release trapped crude oil and natural gas that was previously uneconomic to develop.")

[v] (file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_ednref5) Sellers, *supra*, note i.

[vi] (file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_ednref6) *Id.*

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1) *Induced Earthquakes*, U.S. Geological Survey,
<http://earthquake.usgs.gov/research/induced/overview.php> (last visited Oct. 16, 2016).
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(file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_ednref12)
2) Justin Rubinstein, *Yes, Humans Really are Causing Earthquakes*, U.S. Geological Survey,,
<http://online.wr.usgs.gov/calendar/2015/aug15.html> (last visited Oct. 16, 2016).
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3) *Id.*
- [xiv]
(file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_ednref14)
4) *Id.*
- [xv]
(file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_ednref15)
5) *Id.*
- [xvi]
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6) *Id.*
- [xvii]
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7) *Id.*
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8) *Id.*
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9) *See generally* Jody Freeman, *Should the Federal Government Regulate Fracking, Yes: A National Issue Can't Be Addressed State by State*, Wall St. Journal (April 14, 2013 4:16 PM),
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[xxii]

(file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_ednref2 2) *Id.*

[xxiii]

(file:///C:/Users/Evan/Documents/KJournal/2016%20blogs/Blogs/Nichols%20Blog.docx#_ednref2 3) *Hillary Clinton's Plan for Revitalizing Coal Communities*, Hillary for America, <https://www.hillaryclinton.com/briefing/factsheets/2015/11/12/clinton-plan-to-revitalize-coal-communities/> (last visited Oct. 19, 2016).

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[xxv]

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